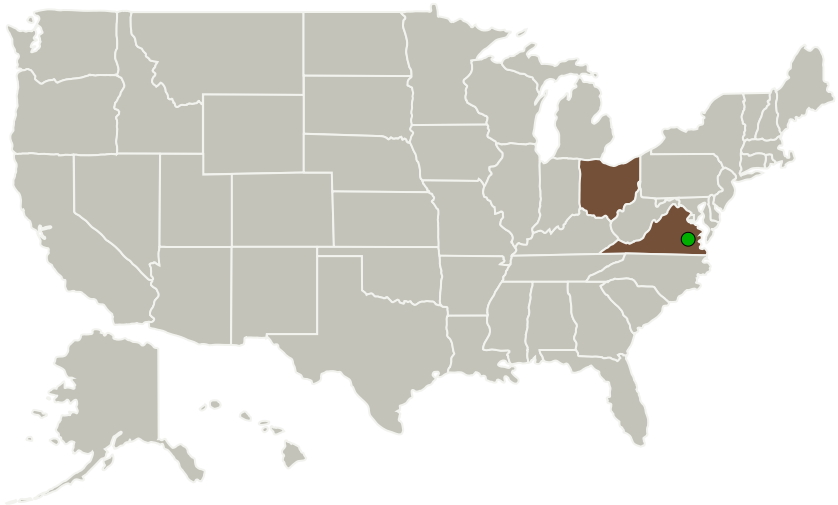
High-Speed Noninvasive Multi-Parameter Laser Diagnostics for High-Mach-Number Flows, Phase I

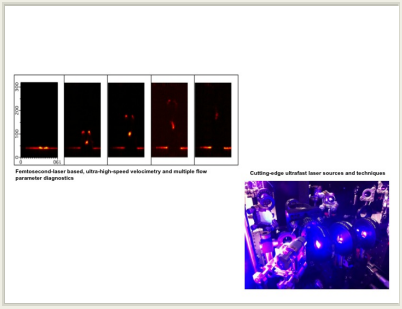
Completed Technology Project (2014 - 2014)

Project Introduction

Numerous ground test and wind tunnel facilities are used extensively to generate forces and moments as well as surface measurements of test articles required to validate computational tools used to extrapolate wind tunnel data to realistic flight conditions and hardware. Accurately mapping velocity flow fields remains a significant challenge in these facilities. In addition, spatially and temporally resolved measurements of flow parameters such as density, pressure, and temperature are of paramount importance. Intrusive probe type devices disturb the flow field while traditional particle-seeded techniques are not feasible in shock layers or stagnation regions. Seeded molecular tagging approaches can not only alter the mean flow, but also introduce unsteady disturbances and requires sufficient upstream seeding in order to diffuse into the boundary layer. Additionally, seeding can contaminate the tunnels, can become expensive, and reduce the effective run time. This proposal offers an integrated package of truly cutting-edge, multidimensional, seedless velocimetry and flow diagnostics for ground test facilities. The concepts and ideas proposed are ranging from proof-of-principles demonstration of novel methodologies using kHz-rate femtosecond (10-15 sec) duration laser sources to measurements in realistic tunnel conditions expected in the current solicitation. In addition, the technologies and tools developed will be packages into robust and user-friendly testing platforms enabling dual use capability in both ground and inflight-test environments.

Primary U.S. Work Locations and Key Partners





High-Speed Noninvasive Multi-Parameter Laser Diagnostics for High-Mach-Number Flows Project Image

Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

High-Speed Noninvasive Multi-Parameter Laser Diagnostics for High-Mach-Number Flows, Phase I

Completed Technology Project (2014 - 2014)

Organizations Performing Work	Role	Type	Location
Spectral Energies, LLC	Lead Organization	Industry Small Disadvantaged Business (SDB)	Dayton, Ohio
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Ohio	Virginia

Project Transitions

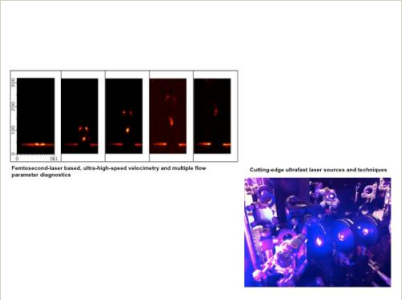
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140727)*

Images



Project Image
High-Speed Noninvasive Multi-Parameter Laser Diagnostics for High-Mach-Number Flows Project Image
(https://techport.nasa.gov/image/134984)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Spectral Energies, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

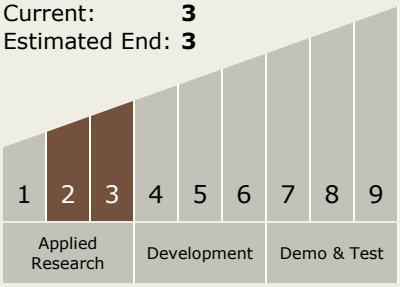
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Sukesh Roy

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.8 Ground and Flight Test Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System